EFFECTIVENESS OF SOFTWARE SUSTAINMENT

RESEARCH REPORT

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Government leaders? policy decisions can significantly impact the acquisition of weapon systems for warfighters. Two such decisions were made in 1998 and 2004 within the U.S. Army. While these decisions may impact system acquisition, they can also affect important sub-elements of the acquisition process, such as sustainment support of software operating within systems. This study researched software sustainment support within the Army Command, Control, Communications, Computer, Intelligence, Sustainment, and Reconnaissance (C4ISR)community following enactment of these two acquisition policy decisions. Specifically, the study researched the perception of user/operators, Program Executive Officer/Program Manager (PEO/PM) and software sustainment support activity (SSSA) personnel about the quality, cost, timeliness, and thoroughness of software support before and after these two policy decisions. The study also assessed differences in the perception of software support within different sectors of the C4ISR community. Constrained by limited response to the research survey, the study results were based on a very small sample of the Army C4ISR community. The study was also unable to control other factors that could have influenced perception of software sustainment support. Within these constraints, the study indicates that, in general, perceptions of software sustainment support are the same or have only slightly improved since the two policy decisions. However,various sectors of the Army C4ISR community have different ideas about which aspects of software sustainment support should be further improved. While most PEO/PM personnel believe improvements are required in areas of the timeliness of software upgrades and system accreditation, most SSSA personnel believe improvements are required in the cost of field software support.

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DISCLAIMER

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ABSTRACT

Government leaders' policy decisions can significantly impact the acquisition of weapon systems for warfighters. Two such decisions were made in 1998 and 2004 within the U.S. Army. While these decisions may impact system acquisition, they can also affect important sub-elements of the acquisition process, such as sustainment support of software operating within systems. This study researched software sustainment support within the Army Command, Control, Communications, Computer, Intelligence, Sustainment, and Reconnaissance (C4ISR) community following enactment of these two acquisition policy decisions. Specifically, the study researched the perception of user/operators, Program Executive Officer/Program Manager (PEO/PM) and software sustainment support activity (SSSA) personnel about the quality, cost, timeliness, and thoroughness of software support before and after these two policy decisions. The study also assessed differences in the perception of software support within different sectors of the C4ISR community.

Constrained by limited response to the research survey, the study results were based on a very small sample of the Army C4ISR community. The study was also unable to control other factors that could have influenced perception of software sustainment support. Within these constraints, the study indicates that, in general, perceptions of software sustainment support are the same or have only slightly improved since the two policy decisions. However, various sectors of the Army C4ISR community have different ideas about which aspects of software sustainment support should be further improved. While most PEO/PM personnel believe improvements are required in areas of the timeliness of software upgrades and system accreditation, most SSSA personnel believe improvements are required in the cost of field software support.

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CHAPTER 1
INTRODUCTION

Prior to 1998, life-cycle support for U.S. Army weapon systems transitioned from Program Management Offices (PMO) that developed systems to Army Materiel Command (AMC) major subordinate commands (MSCs) providing logistical support until end of system life. In an attempt to get PMs and MSCs to work together more closely, Gil Decker, former Assistant Secretary of the Army for Research, Development, and Acquisition (ASA[RDA]) (Decker, 1997), directed that Army Program Managers (PMs) are responsible and accountable for the life-cycle management of their assigned programs. Placing responsibility for system life-cycle support in the hands of the PM dramatically changed their relationship with MSCs. PMs became MSC customers rather than transition organizations. MSCs had to rely on the PMs for funding.

In August 2004, Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) Claude Bolton signed a Memorandum of Agreement (MOA) (Bolton/Kern, 2004) with the Commander of AMC (GEN Paul Kern) creating Life Cycle Management Commands (LCMCs) of the AMC MSCs (Aviation and Missile Command [AMCOM], Tank and Automotive Command [TACOM], Communications-Electronics Command [CECOM], Simulation and Training Technology Command [STRICOM]). The MOA encouraged synergy by aligning MSCs to affiliated Program Executive Offices (PEOs) and PMOs.

Did these policy changes improve, diminish, or leave unchanged the cost, timeliness, quality, and thoroughness of weapon system software sustainment for C4ISR systems?

Background

In the past 60 years of modern weapon system development, the U.S. Congress, Department of Defense (DoD), and the military services have modified acquisition policy and guidance dozens of times. The cumulative impact of these changes on weapon system development and acquisition has been profound and lasting.
Command, Control, Communications, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems used by today's warfighters are highly software intensive. The quality, functionality, and performance of the software within these systems throughout the life of the programs must meet the highest possible standards to support soldiers in garrison, training, exercise, and contingency operations. These high standards must be achieved while minimizing costs, a difficult challenge as the United States considers reduced budgets and diminished operations in Iraq and Afghanistan.

The Under Secretary of Defense for Acquisition, Technology and Logistics (USD[AT&L]) articulated requirements for "Obtaining Greater Efficiency and Productivity in Defense Spending" in two recent memorandums (Carter, June 28, 2010, and Sept. 14, 2010.) Estimates indicate that 70 percent of life-cycle costs are operations and support, while only 30 percent are development and fielding costs. (Carter, Sept. 14, 2010). While hardware costs have decreased dramatically to less than 20 percent of total life-cycle system expenditures, the remaining 80 percent of life-cycle costs comprise all non-hardware expenses such as training, administrative support, management, and software (van Vliet, 2002), with software making up the majority of these remaining costs. A number of recognized authorities on software engineering in the 1980 timeframe performed studies estimating sustainment costs for commercial software systems between 40 percent and 75 percent of total life-cycle costs (Lientz and Swanson, 1980) (Boehm, 1981). To the dismay of these same experts, these statistics have not changed much in the years since. Bennetti (1997) indicates that later surveys revealed software sustainment comprises between 40 percent and 90 percent of total life-cycle software expenditures.

These figures indicate that software sustainment, and the cost of this sustainment, can have a profound impact on the success or failure of a system over its total life. Yet, we know very little about the direct impact DoD and military services' acquisition policy changes have on this critical area of weapon system life-cycle management.

Purpose of the Study

The objective of this study was to collect the opinions of development, sustainment, and user organizations regarding the quality, thoroughness, timeliness, and cost-effectiveness of software sustainment support for the Army C4ISR enterprise before and after two significant U.S.

Army acquisition policy decisions were implemented in 1997 and 2004. Once collected, this information was analyzed to determine significant findings regarding the perception of software sustainment before and after these two policy decisions. The information also provided perceptions regarding what areas of software support services could be improved.

A. Research Questions

In an effort to address these issues for the U.S. Army C4ISR system enterprise, this paper seeks to answer the following specific questions:

(1) Is the perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs and software support service providers better or worse since the 1997 ASA(RDA) decision?

(2) Is the perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs, and software support service providers better or worse since the 2004 MOA between the ASA(ALT) and CG AMC?

(3) What is the current perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs, and software support service providers?

B. Research Hypotheses

H1: Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems after the 1997 ASA(RDA) decision compared to the perception of C4ISR software sustainment support prior to 1997.

H2: Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems after the 2004 ASA(ALT)/AMC MOA compared to the perception of C4ISR software sustainment support prior to 2004.

H3: Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems today.

Significance of the Study

This study contributes information about the impact DoD and military services' acquisition policy changes have on life-cycle software support and thus, overall system life- cycle cost and effectiveness. The study is based on the perception of quality, timeliness, cost, and thoroughness of software sustainment support by Army C4ISR PM, user/operator, and software support personnel.

Overview Methodology

The study was designed to survey personnel involved in the business of developing, acquiring, supporting, and operating software intensive Army C4ISR systems and to solicit their opinions on the quality, timeliness, cost, and thoroughness of software sustainment support. Survey participants were divided into three groups: those involved with Army C4ISR systems prior to the 1998 decision to make PMs responsible for system life-cycle management, those involved with Army C4ISR systems prior to the 2004 decision to create AMC Life Cycle Management Commands (LCMCs), and those involved with Army C4ISR systems since the 2004 decision.

The survey vehicle was posted on an Army Knowledge Online (AKO) Web page with unlimited access. Emails were sent to members of the Army C4ISR community, asking participants to complete the online survey. Survey results were analyzed to quantify the perception participants have of software sustainment support during these three periods. Participants were also asked to select areas in which current software sustainment support should improve.

Scope, Limitations, and Delimitations

The scope of the study was constrained in several areas. This research paper was limited to U.S. Army C4ISR systems supported by Team C4ISR comprised of PEO C3T and its Program Management Offices (PMO); PEO IEW&S and its PMOs; PEO EIS and its PMOs; and the CECOM LCMC Software Engineering Center (SEC). The study was intended to include U.S. Army C4ISR system user units, staff, and operators. Similar systems in other military services or DoD agencies are outside the scope of this research paper. A precise estimate of the size of the Army C4ISR community was not available and a random process for sampling the community was not possible. This, as well as the limited response to the survey, prevented collection of a statistically significant number of survey responses.

This research paper does not address objective measures of system software functionality, performance, quality, and cost of software support over the program life. The study is focused on subjective opinion or perception of these criteria by PM, user, and software support staff. While the study may answer research questions about the perception of software sustainment support for Army C4ISR systems before and after significant policy decisions, the study does not isolate these decisions as the only reasons for differences in the perception of software support during these periods. Other factors may have affected perceptions. For example, in 2001, the United States began Operation Enduring Freedom, launching an attack on terrorist forces in Afghanistan in response to 9/11 attacks in the United States. In 2003, the United States began Operation Iraqi Freedom. These two conflicts continue today. The nature and provision of software sustainment support for Army C4ISR systems during these two conflicts may have influenced perceptions of software sustainment support compared to perceptions prior to 1998.

Assumptions

Providing data regarding the quality, timeliness and cost of software support is not all that is required to address software sustainment support. Perceptions of PM, user, and software support personnel regarding the quality, timeliness, cost, and thoroughness of software sustainment support are as important to an assessment of these services as are quantitative measures of these factors. A useful analysis of the perception of software sustainment support within the Army C4ISR community is possible without a statistically significant number of survey respondents. While not meeting the statistical criteria for significance, data collected on perceptions of software support are useful in arriving at conclusions for this study.

While not the only factors affecting perceptions of software sustainment support for Army C4ISR systems, the two policy decisions in question significantly influenced support. Therefore, the inability to isolate key policy decisions as the only factors causing differences in the perception of software sustainment support for Army C4ISR systems does not diminish the value of study results.

Definition of Key Terms

See Glossary of Acronyms and Terms.

Organization of the Research Paper

Chapter 1 introduced the background, problem statement and purpose of the study with research questions and hypotheses. The introduction also provides a description of the significance of the study, an overview of the study methodology, and scope, limitations, and delimitations of the study. Chapter 2 is a literature review describing professional and academic information sources and DoD and military service policies regarding software development and software life-cycle management. Chapter 3 describes the research methodology including the research perspective and design, survey participants, the survey instrument, data collection and analysis. Chapter 4 describes survey results and analyzes them in terms of the study hypotheses. Chapter 5 provides a summary and conclusions, suggesting implications for further research.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter summarizes results of a review of literature applicable to the research questions. The literature review focused on academic, professional, and government documentation and studies regarding software engineering, software support, and life-cycle software costs. Original studies and surveys documenting the cost of life-cycle software support predominantly were from the early 1980s. These studies continued to be referenced by other academic books and studies well into the late 1990s. Separate studies addressing costs and processes for supporting military software-based systems relied heavily on these same studies.

Army policies implement directives and memoranda issued by military leaders. These documents validate changes to Army acquisition policies which serve as the impetus behind the three research questions. References used are roughly categorized into (1) professional and academic sources in the area of software engineering, and (2) DoD and Army acquisition policy documents.

Professional and Academic Sources

Academic sources address studies involving support to commercial software information technology systems. These studies compare the cost of supporting software after implementation to the overall cost of the software program. The literature search involved software support costs for commercial systems from studies in the early 1980s, such as Boehm (1981) and Lientz and Swanson (1980). Existing studies and data regarding sustainment of military C4ISR systems focus on the cost of system support compared to life-cycle costs of a program. Estimates of C4ISR system software sustainment are based on commercial models and historical data, such as U.S. Air Force Software Technology Support Center Cost Analysis Group (2002).

Department of Defense and Military Service Directives and Policies

Department of Defense (DoD) and Army acquisition policy documents articulate official decisions and guidelines affecting weapon system acquisition and the software embedded within these systems. Such documents as AR 70-1 (Dec. 15, 1997) and the Carter memo (Sept. 14, 2010) are included. Available sources did not address the quality, timeliness, or thoroughness of sustainment support for either commercial or military systems.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

This chapter describes the methodology, design, survey population, research instrument, data collection and analysis used in the research. The study makes inquiries about the affect Army acquisition policy changes have on software sustainment support. Specifically, do these policy changes and organizational alignments improve, diminish, or leave unchanged the cost, timeliness, quality, and thoroughness of weapon system software sustainment for C4ISR systems?

In April 1997, the ASA(RDA), Mr. Decker, issued a memorandum directing that Army PMs are responsible and accountable for the life-cycle management of their assigned programs. In August 2004, the ASA(ALT), Mr. Bolton, and Commander of AMC, GEN Kern, signed a memorandum of agreement creating Life Cycle Management Commands (LCMCs) of the AMC MSCs in order to align AMC MSCs with appropriate Program Executive Offices (PEOs). The research seeks to understand the perception of the quality, timeliness, cost, and thoroughness of software sustainment support for Army C4ISR systems following these two policy decisions.

Research Perspective and Design

The research study was a phenomenological approach, aimed at understanding the perception of the quality, timeliness, cost, and thoroughness of software sustainment support within the Army C4ISR development, operations, and support community. Understanding the perception of software sustainment support before and after the two significant acquisition policy decisions were made adds information as to the effect such policy decisions have on life-cycle software support.

The design selected for this research was a survey of personnel engaged in either the development, support, or operation of Army C4ISR system software. The uniform resource locator (URL) address for the posted survey form was provided in emails to leaders within the Army C4ISR community with an invitation to voluntarily access the Website and complete the survey, as well as forward the email to individuals and staff they believed should complete the survey form.

Research Questions and Hypotheses

A. Research Questions

(1) Is the perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs and software support service providers better or worse since the 1997 ASA(RDA) decision?

(2) Is the perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs, and software support service providers better or worse since the 2004 MOA between the ASA(ALT) and CG AMC?

(3) What is the current perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs, and software support service providers?

B. Hypotheses

(H1) Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems after the 1997 ASA(RDA) decision compared to the perception of C4ISR software sustainment support prior to 1997.

(H2) Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems after the 2004 ASA(ALT)/AMC MOA compared to the perception of C4ISR software sustainment support prior to 2004.

(H3) Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems today.

Participants and Population

The survey population consisted of military, government civilian, and contractor personnel engaged in the development, support, and/or operation of Army C4ISR systems. This group included leadership, program management, and staff from PEO C3T, PEO IEW&S, and PEO EIS. Software sustainment support leaders and staff from the Army CECOM LCMC Software Engineering Center (SEC) were included, as well as operators of C4ISR systems within Army tactical units around the globe.

Unit of Analysis and Research Variables

The individual survey participant was the unit of analysis. There were three primary variables used in the analysis: the time period the respondent began involvement with Army C4ISR systems, the current role of the respondent, and respondent scoring of software sustainment support. The time period variable had one of three possible values. The earliest was the period prior to the ASA(ALT) decision to make PMs responsible for system life-cycle management, or prior to 1998. The next time period was after the ASA(RDA) decision but prior to the MOA between the ASA(ALT) and Commander AMC, or between 1998 and 2004. The third time period was any time after 2004. There were five possible roles for participants. One was government and military members of a C4ISR PEO or PMO. Another was government and military members of a software sustainment support activity. In this case, CECOM LCMC SEC. Government and military operators of Army C4ISR systems were a category. The survey also permitted a category of Other. Survey participants scored software sustainment support based on qualitative values listed as Excellent, Good, Adequate, Poor, and Very Poor. These qualitative scores were translated into numerical values of 5, 4, 3, 2, and 1 for purposes of calculating statistical averages.

Research Instrument

A survey was developed for use in collecting information on the variables. The survey form was posted on the Army Knowledge On-Line (AKO) Website accessible by personnel who were given the uniform resource locator (URL) address. The survey announcement was emailed to appropriate PEO, PM, CECOM SEC, and user units and staff requesting information on opinions about the quality, timeliness, thoroughness, and cost-effectiveness of software sustainment support for C4ISR systems. Emails also asked recipients to forward the request for participation to other staff and members of the Army C4ISR community. Survey results were posted to the survey Website. Survey questions and response options are at Appendix A.

Pilot Study

A pilot survey form was provided to five individuals to ensure survey questions and response options were sufficient to answer research questions. The pilot resulted in modifying the survey form to permit inclusion of C4ISR contract personnel and add more areas of possible software sustainment support improvement selections in Question 6. The pilot group also advised against posting the survey on a commercial survey Website. They indicated government and military personnel would be hesitant to respond to such a survey on a commercial Website. As a result, the survey was posted on an Army Knowledge On-Line (AKO) Web page. The survey form was further modified to accommodate restrictions mandated by the AKO survey development tool.

Data Collection Procedures

Survey results were collected on-line at the AKO Website where the survey instrument was posted. AKO saved and listed answers for each of the seven survey questions for each respondent. Results posted on the AKO web site were retrieved and documented in an off-line spreadsheet. The spreadsheet tools were used to sort and count responses in order to summarize and statistically analyze results.

Data Collection and Statistical Analysis

Spread sheets used to capture survey data were also used to sort and summarize data describing key variables. Summarized information includes such figures as total number of respondents; number and percentage of respondents with C4ISR experience prior to 1998, between 1998 and 2004, since 2004; number and percentage of respondents who are PEO/PM, software support, and user personnel. Information used to describe the survey population partitions set the stage for analyzing data collected about the quality, timeliness, cost, and thoroughness of software support. Scores of software support by survey participants were totaled, graphed, and numerical averages calculated. Similar total and statistical calculations were generated for software support scores for each survey population partition to assess the perception of software support according to type C4ISR community members.

Setting and Environment

Email requests to log into and participate in the AKO survey were sent to key personnel within the Army C4ISR PEO/PM and CECOM SEC activities. Emails were sent to participants' AKO addresses. Participants likely completed the surveys from their office environment on government installations. These personnel were also asked to forward the email to their staff and customers with a request to participate in the survey. This method of proliferating the request for Army C4ISR community participants was intended to increase the number of survey respondents. Unfortunately, the number of respondents was too low to result in a statistically significant sample of the Army C4ISR community. Results, while not statistically significant, provide useful information toward answering the research questions.

Bias and Error

Lack of random sampling, the low number of respondents, and disproportionate number of responses from some sectors of Army C4ISR community indicate overall scoring statistics may be biased. Results and conclusions address these possible biases in the data.

Validity

Questions in the research instrument aimed at partitioning the survey population according to their experience during timeframes affected by the study policy decisions assures that later questions regarding quality, timeliness, cost, and thoroughness of software sustainment support represent the content that the research is intended to address.

Summary

As a study of the adequacy of Army C4ISR software sustainment support after implementing significant acquisition policy decisions, the research is well situated to use a phenomenological approach, collecting information through a population survey. Research questions, and resulting hypotheses, focus the study on specific issues. The survey instrument used a relatively straight-forward seven-question format to establish the time-frame during which population members had been involved in C4ISR support and to which population subgroup they belonged . The survey questions were developed to directly address variables needed to answer research questions. The survey was posted on a Website easily accessible by potential survey respondents. Data collected was sorted, summarized, and analyzed using common statistical analysis tools.

Results will show a weakness not in the methodology, but in the execution of the approach to collecting data. The entire population of possible respondents could not be notified about the survey and a random sample set of survey participants was not possible. Instead, key personnel within the population were notified and asked to proliferate the survey to other potential members. As a volunteer, rather than a mandated, activity, completion and further distribution of the survey was limited. Survey respondents were too few and lacked necessary randomness to achieve what could be considered a statistically significant portion of the population. A disproportionate number of respondents are from certain sectors of the population. While these limitations reduce the value of the study in reflecting the perspectives of the entire population, they do not diminish the value of assessing data about the restricted population sectors for which results can be analyzed.

CHAPTER 4

DATA ANALYSIS AND RESULTS

Introduction

This chapter presents results of the study. Results are presented in four sections. The first section describes the survey respondents based on the number of participants according to the timeframe they joined the Army C4ISR community and the type of C4ISR activities in which they are currently engaged (i.e. user/operator, PEO/PM, software sustainment support.) The second section provides scoring of software sustainment support based on survey participant time frame. The third section provides scoring of software sustainment support based on type of C4ISR respondent. The fourth section provides overall scoring results.

A spreadsheet recording survey results is at Appendix B. To calculate mean average scores, numerical values were assigned to each score. A score of excellent was weighted as 5, good as 4, adequate as 3, poor as 2, and very poor as 1.

Participant Profile

A total of 42 survey forms were completed for this study. Participants were asked to identify which role they fulfill in the Army C4ISR community. Results are shown in Table 1 and Figure 1, below. A disproportionately large number of participants are designated as Software Sustainment Support Activity and PEO/PM personnel, while a disproportionately small number of respondents are User/Operator and Contractor personnel. Because PEO/PM, Software Sustainment Support Activity, and Other categories of participants make up 93 percent of the survey results, analysis by type role of respondents focuses on these three categories.

Participants were also asked to identify when they became a part of the Army C4ISR community. This data assists in isolating those respondents who are able to provide their

USER/OPERATOR	1
PEO/PM	10
SSSA	23
CONTRACTOR	2
OTHER	6
TOTAL	42

Table 1, Participants by Role

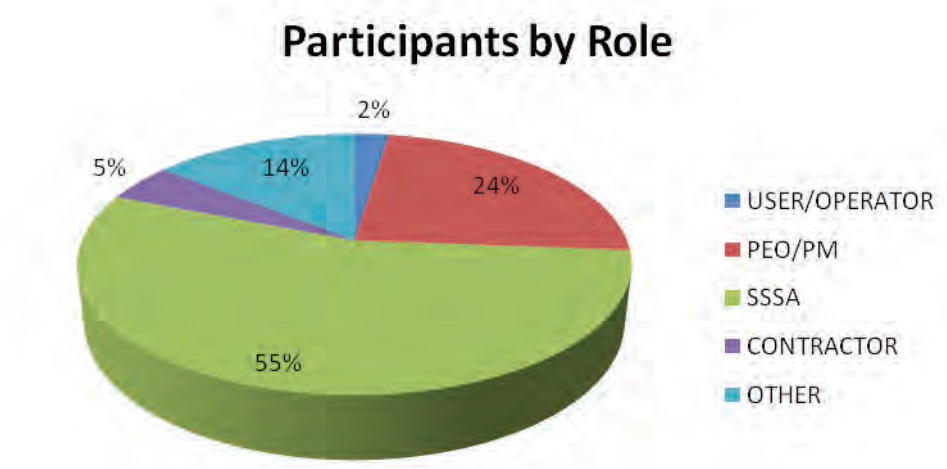

Figure 1, Participants by Role

perceptions of software support prior to the 1998 ASA(RDL) direction that PMs are responsible for life-cycle management of systems, those able to provide their perceptions of software support between 1998 and 2004 after the ASA(RDL) direction, and those after 2004 when the Army ASA(ALT) and CG AMC created LCMCs. The portion of survey respondents who were part of the Army C4ISR community prior to 1998 is larger than anticipated, while the portion of respondents in the other two categories is smaller than anticipated.

BEFORE 1998	28
1998 - 2004	5
AFTER 2004	9
TOTAL	42

Table 2, Participants by Year

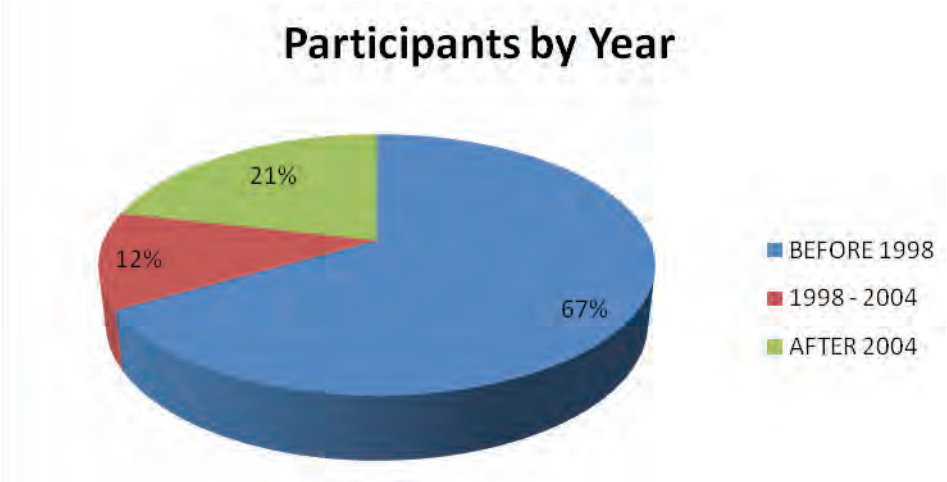

Figure 2, Participants by Year

Ratings by Timeframes

Participants who were part of the Army C4ISR community prior to the 1998 ASA(RDA) decision- making PMs responsible for system life-cycle management scored software sustainment support as shown in Table 3 and Figure 3, below. The weighted mean score for software sustainment support prior to 1998 was 3.46, or between adequate and good. Figure 3 provides a histogram of scoring frequency, illustrating that the number of participants scoring software support as adequate and good were equal with a significantly smaller number of excellent, poor, and very poor scores.

	FREQ	WTD
EXCELLENT	3	15
GOOD	11	44
ADEQUATE	11	33
POOR	2	4
VERY POOR	1	1
TOTAL	28	
WEIGHTED MEAN		3.46

Table 3, Scores Prior to 1998 (All Roles)

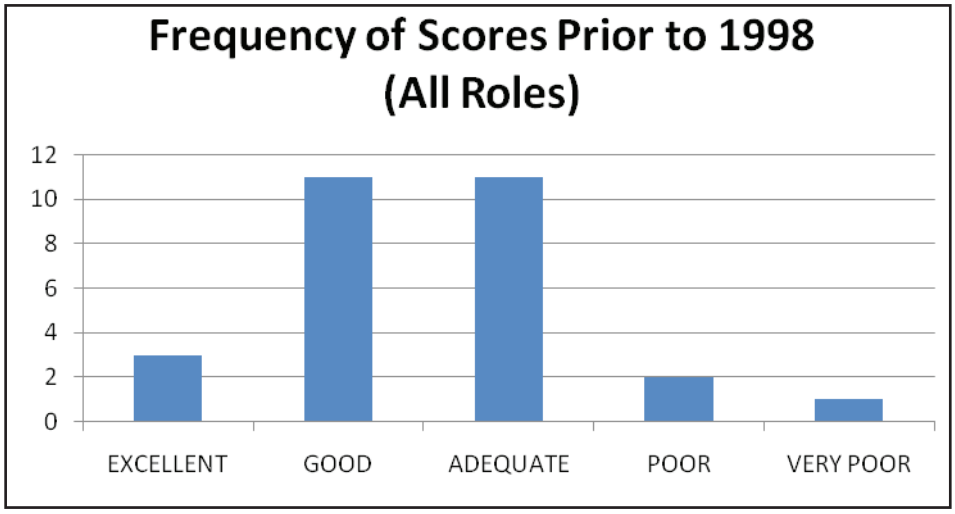

Figure 3, Frequency of Scores Prior to 1998 (All Roles)

Participants who were part of the Army C4ISR community between 1998 and 2004 scored software sustainment support as shown in Table 4 and Figure 4, below. The weighted mean score for software sustainment support between 1998 and 2004 was 3.74, again between adequate and good, similar to pre-1998 scores. However, Figure 4 provides a notably different histogram of scoring frequency, illustrating that the number of participants scoring software support as good predominated scoring with substantially fewer scores at higher and lower levels, creating a more normal distribution of scores.

	FREQ	WTD
EXCELLENT	2	10
GOOD	20	80
ADEQUATE	8	24
POOR	1	2
VERY POOR	0	0
TOTAL	31	
WEIGHTED MEAN		3.74

Table 4, Scores Between 1998 and 2004 (All Roles)

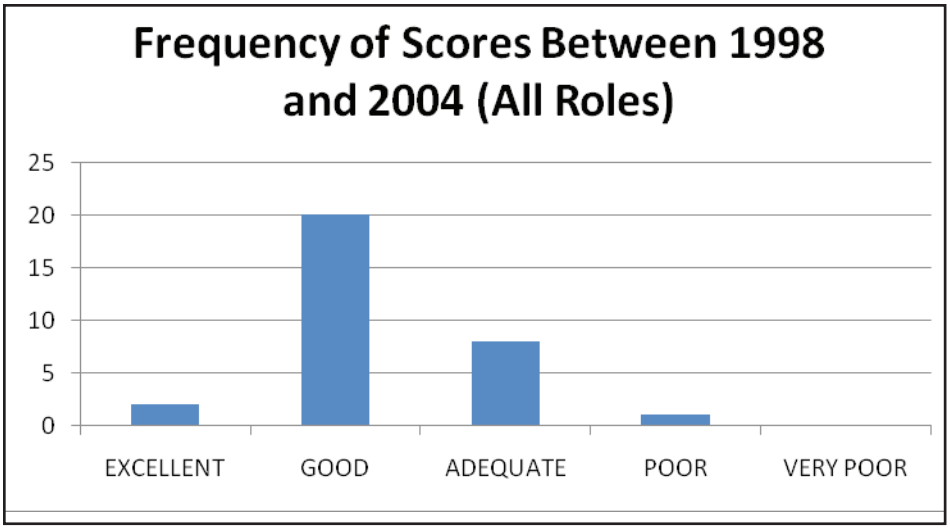

Figure 4, Frequency of Scores Between 1998 and 2004 (All Roles)

Participants who were part of the Army C4ISR community after the 2004 MOA between ASA(ALT) and CG AMC to create Life Cycle Management Commands, scored software sustainment support as shown in Table 5 and Figure 5, below. The weighted mean score for software sustainment support prior to 1998 was 3.9, slightly more than the average score between 1998 and 2004. Figure 5 shows a histogram of scoring frequency very much like the scoring distribution between 1998 and 2004.

	FREQ	WTD
EXCELLENT	6	30
GOOD	27	108
ADEQUATE	8	24
POOR	1	2
VERY POOR	0	0
TOTAL	42	
WEIGHTED MEAN		3.90

Table 5, Scores After 2004 (All Roles)

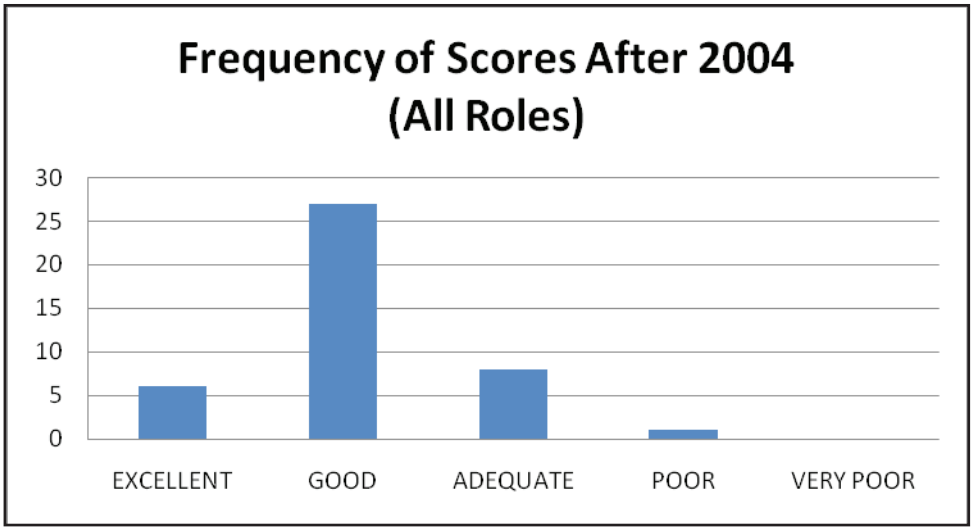

Figure 5, Frequency of Scores After 2004 (All Roles)

Ratings by Participant Type

Of the total participant surveys completed, 24 percent were from PEO/PM staff, 55 percent were from Software Sustainment Support Activities (SSSA), and 14 percent were from participants labeling themselves as Other. Together, these three sectors of the Army C4ISR population sample constitute 93 percent of the survey respondents. Table 6 and Figure 6 illustrate the weighted average scoring and distribution of scores for software support in the three time frames for these three sectors of the Army C4ISR community.

Prior to 1998, average scoring for all respondents was 3.46. During this same time period, average scoring by PEO/PM participants was 3.5; for SSSA participants it was 3.53, and for Other participants it was 3.33. Except for outlier scores above and below good and adequate, the frequency of PEO/PM scoring during this time frame was similar to distributions within the overall participant sample. Like PEO/PM participants, the frequency of scores for SSSA participants during this time was similar to overall scoring, but more widely distributed. Distribution of scores for Other participants during this time was markedly different than other sectors, showing a stronger tendency to score software support as adequate, rather than good.

Between 1998 and 2004, average scoring for all respondents was 3.74. During this time period, average scoring by PEO/PM respondents was 4; for SSSA respondents it was 3.76, and for Other respondents the average was 3.25. Because all PEO/PM respondents scored software support between 1998 and 2004 as good, scoring distribution was limited to a single rating. As in scoring prior to 1998, SSSA respondents had a distribution of scores similar to the overall population sample, but more widely distributed than scoring by PEO/PM respondents. Because Other respondents scored software support between 1998 and 2004 similar to scoring prior to 1998, score distribution tended toward adequate, rather than good.

After 2004, average scoring for all respondents was 3.9, slightly improved over previous periods. Average scoring for PEO/PM participants during this time was 3.7; for SSSA participants it was 3.96; for Other participants average scoring in this time frame was 3.75. PEO/PM participant scoring distribution after 2004 shows a slightly greater tendency to score software support in the lower ratings than the overall population sample. The distribution of SSSA scores after 2004 was similar to that of overall scoring, but had a noticeably greater number of higher scores than did the PEO/PM sector. The distribution of Other participant scoring showed a marked change after 2004, with average scoring shifting from 3.25 in the previous time-frame to 3.83. Although different than other profiles, the distribution of Other scores after 2004 is much closer to overall scores and PEO/PM and SSSA sectors than in previous periods.

In the overall survey population, average scores tended to increase for each of the three time periods under study. This trend was influenced by each of the three sectors that make up 93 percent of survey responses from the Army C4ISR community. One exception was the PEO/PM sector with an average rating between 1998 and

2004 of 4, while average scoring after 2004 was 3.7. Another exception was the Other sector of participants, with average scores of 3.33 prior to 1998, 3.25 between 1998 and 2004, and 3.83 after 2004. Score distributions for these three sectors varied. Score distributions for the SSSA sector tended to be more widely distributed than either the PEO/PM or Other sectors, indicating the SSSA population has a more diverse perspective of software support, while the other two sectors have a more homogenous perspective of software support.

	PRIOR TO 1998			BETWEEN 1998 AND 2004			AFTER 2004		
	PEO/PM	SSSA	OTHER	PEO/PM	SSSA	OTHER	PEO/PM	SSSA	OTHER
EXCELLENT	0	3	0	0	2	0	0	5	0
GOOD	3	7	1	8	10	1	8	12	5
ADEQUATE	3	4	2	0	4	3	1	6	1
POOR	0	2	0	0	1	0	1	0	0
VERY POOR	0	1	0	0	0	0	0	0	0
WEIGHTED MEAN	3.50	3.53	3.33	4.00	3.76	3.25	3.70	3.96	3.83

Table 6, Scores for Each Time Period (PEO/PM, SSSA, OTHER)

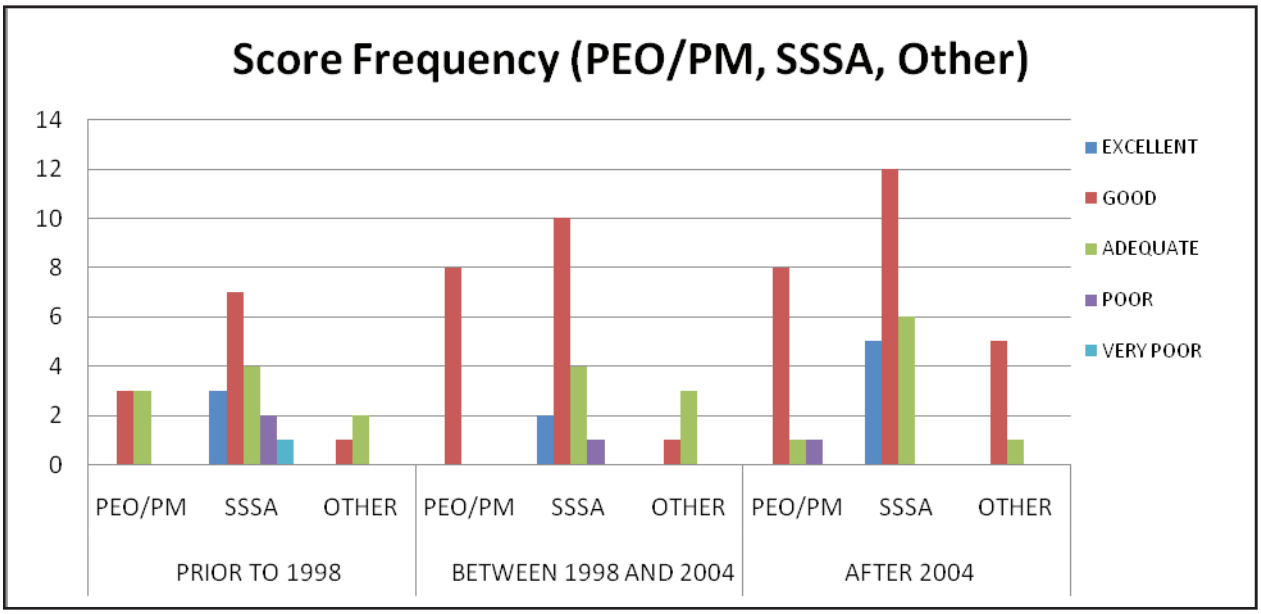

Figure 6, Frequency of Scores for Each Time Period (PEO/PM, SSA, Other)

Suggested Software Support Improvements

Respondents were asked to select areas in which they believed software sustainment support should improve. Frequency of suggestions are graphed in the Pareto Chart at Figure 7, below. Over all respondents, improving the cost of field support was the most frequent suggestion by a substantial margin. The second most frequent suggestion was improving timeliness of system accreditation with improving the timeliness of software upgrades a close third. Two categories tied for fourth: improving the quality and thoroughness of field support and improving the quality of software upgrades. Tied for fifth-highest frequency were improving the quality and availability of online and help desk support.

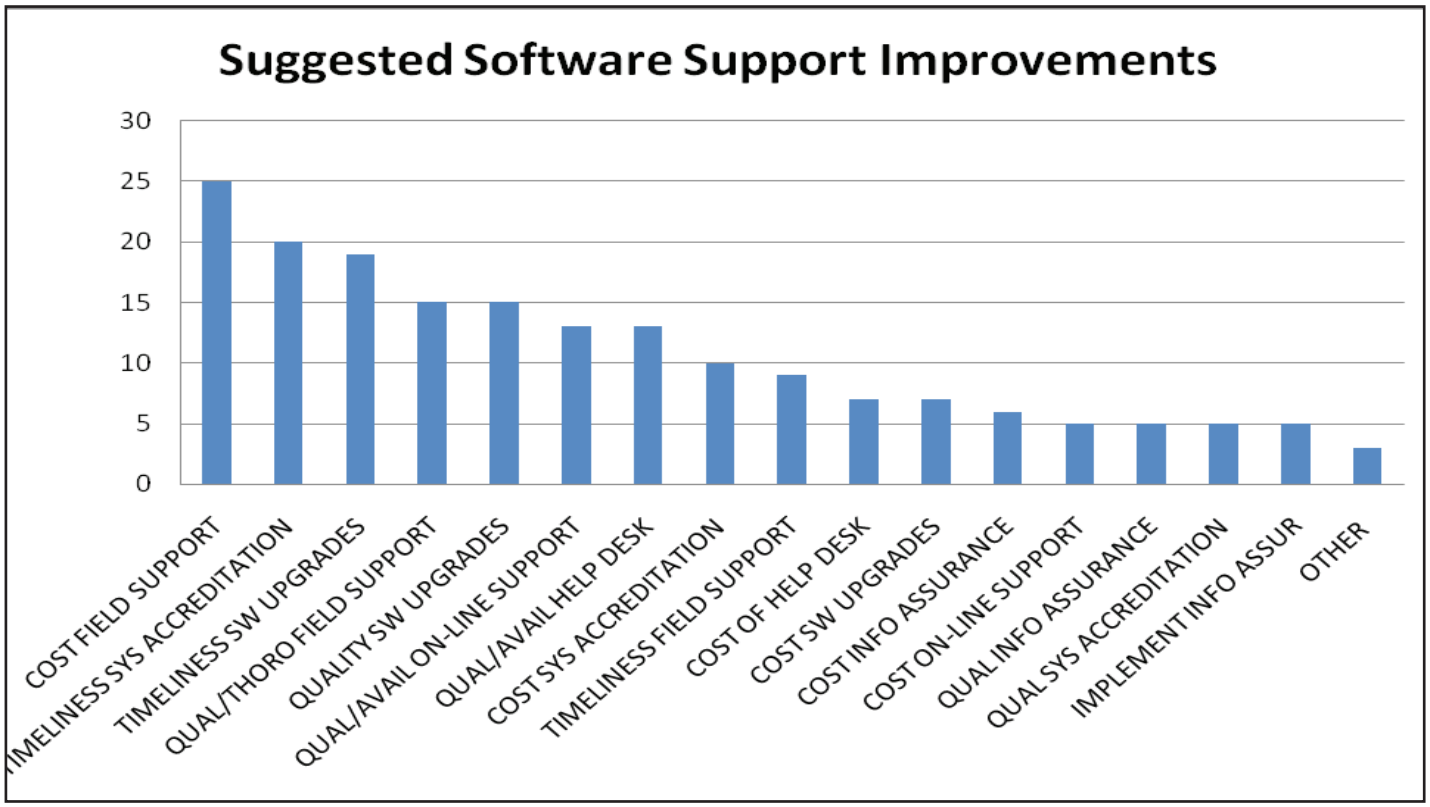

Figure 7, Suggested Software Support Improvements

Figure 8 graphs the frequency of suggestions according to the three largest participant sectors that make up 93 percent of the respondents. PEO/PM respondents suggested improving the timeliness of accreditation with the most frequency, followed by the timeliness of software upgrades and cost of software field support suggested second and third most frequently. Two areas of improvement were suggested with the fourth-highest frequency: quality of software upgrades, and cost of system accreditation. The fifth-highest frequency suggestion was to improve the quality of on line support.

SSSA participants selected improving the cost of field support most frequently by a large margin. The second-highest frequency SSSA suggestions were improving the quality and thoroughness of field support and quality and availability of help desk support. Two improvement areas were suggested by SSSA personnel the third most frequently: quality and availability of online support and timeliness of system accreditation. The fourth most frequently suggested area of improvement was the timeliness of software upgrades. SSSA respondents called out six areas of improvement the fifth most frequently: quality of software upgrades, timeliness of field support, cost of help desk support, quality of information assurance, cost of information assurance, and cost of system accreditation.

Other participants called out three areas of improvement most frequently: quality of software upgrades, timeliness of software upgrades, and timeliness of system accreditation. Improving the cost of help desk and quality of system accreditation were called out the second most frequently by Other participants. Seven improvement areas were called out the third most frequently: cost of software upgrades, cost of field support, timeliness of field support, quality and availability of online support, quality and availability of help desk support, implementation of information assurance, and cost of system accreditation.

Participant Comments

Participants were asked to provide comments on Army C4ISR software sustainment support. Comments varied. However, there were four comments each that focused on concerns about the cost of software upgrades and the capabilities of field engineers and technicians. Two comments each addressed concerns about scheduling or timeliness of support and providing software that permits soldiers to load and install upgrades and security patches. A complete listing of all comments is at Appendix C.

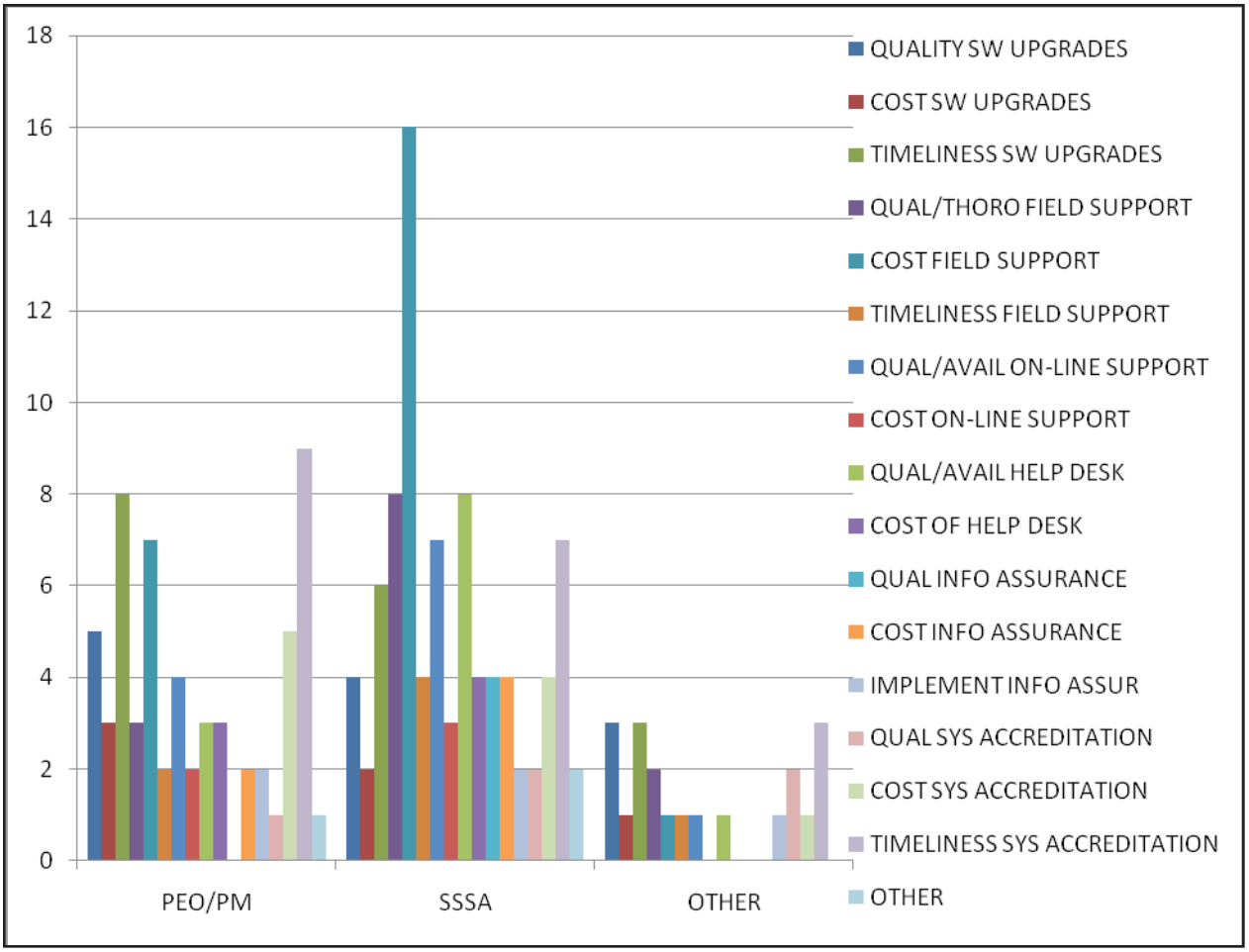

Figure 9, Suggested Software Support Improvements (PEO/PM, SSSA, Other)

Summary of Results

Forty-two individuals from the Army C4ISR community responded to the survey request. Fifty-five percent of the respondents were from the SSSA, 24 percent from PEO/PM staff, 14 percent labeled themselves as Other. The remaining 7 percent was split between User/Operator and Contractor personnel. Software support scoring by all participants prior to the 1998 decision by the ASA(RDA) had a numerical average of 3.46 between good and adequate. Averages for the two subsequent time periods between 1998 and 2004 and after the 2004 ASA(ALT) and CG AMC MOA increased to 3.74 and 3.9, respectively. While these averages indicate a gradual increase in scoring over the three time periods, the differences are not substantial. Distribution of overall scoring was somewhat dual-mode prior to 1998 with respondents equally split between good and adequate. Score frequencies were more normally distributed in the two subsequent time periods.

As the largest participating sector of the Army C4ISR community, SSSA drove scoring that tracked overall scoring distributions in two of the three time periods. Prior to 1998, the dual-mode scoring distribution differed from SSSA's normal distribution because of the large number of PEO/PM and Other participants scoring in the lower rating of adequate. In the two later time periods, all participants tended to rate software support so that scores followed a more normal distribution pattern centered closer to the good rating as shown by numerical averages. Two other notable exceptions exist to the trend implied by overall score distributions. All PEO/PM participants scored software support between 1998 and 2004 as a numerical average 4 or good. After 2004, however, PEO/PM participants scored software support with an average of 3.7 between good and adequate. Other participants scored software support prior to 1998 and between 1998 and 2004 with an average of 3.33 and 3.25, respectively. These lower scores contributed to reduced scoring averages and affected the distribution of scores across the Army C4ISR sample population.

Participants suggested areas in which improvements could be made in software support. Over all respondents, improving the cost of field support was the most frequent suggestion by a substantial margin. Other improvement suggestions in order of frequency included timeliness of accreditation, timeliness of software upgrades, improving the quality and thoroughness of field support, improving the quality of software upgrades, and improving the quality and availability of online and help desk support. Participants also provided a variety of comments, a number of which focused on cost concerns and concerns about the capabilities of field support engineers and technicians.

This chapter described and summarized results of the survey. These results will be used in the final chapter to develop conclusions about the research questions. The final chapter will consider study limitations and assumptions while drawing these conclusions and propose further studies that may clarify or expand these conclusions.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

This study was intended to determine if two decisions within the U.S. Army changed the perception of software sustainment support for C4ISR systems. The study also considered the perceptions different sectors of the Army C4ISR community have regarding software sustainment support. As an ever-increasing part of system performance, software requires support necessary to meet operational requirements so it can perform when the mission demands.

This chapter of the study will review results of the research compared to research questions and hypotheses, review study limitations, and draw conclusions. Implications for further research and recommendations are also presented followed by a summary and conclusion statement.

Summary Statement

Based on the three hypotheses, the following are summary results of the study.

(H1) Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems after the 1997 ASA(RDA) decision compared to the perception of C4ISR software sustainment support prior to 1997. The study generally supports this hypothesis. Survey results show an average software support score of 3.46 (between good and adequate) prior to 1998 and an average score of 3.74 between 1998 and 2004. These averages and the distribution of survey scores indicate the general perception of software support after the 1997 ASA(RDA) decision to make PMs responsible for system life-cycle support was the same, or only slightly better than the perception of software support after the decision.

(H2) Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems after the 2004 ASA(ALT)/AMC MOA compared to the perception of C4ISR software sustainment support prior to 2004. The study generally supports this hypothesis. Average survey scores for software support between 1998 and 2004 were 3.74. After 2004, average survey scores were 3.9. These averages and the distribution of scores indicate the general perception of software support after the 2004 MOA between the Army ASA(ALT) and CG AMC was the same, or only slightly better.

(H3) Among users, developers, and software sustainers, there is no difference in the perception of software sustainment support for C4ISR systems today. This hypothesis is not supported by the study. The PEO/PM and Other sectors of the Army C4ISR population sample tended to score software support in all three time periods more tightly around a single scoring value. The SSSA sector tended to score software support with a wider distribution across scoring levels. The central tendency for the three sectors after 2004 was very similar. However, the Other sector had a central tendency notably closer to adequate than good prior to 1998 and between 1998 and 2004.

When suggesting areas of improvement for software support, the SSSA sector very clearly felt the cost of field software support was primary. Quality and thoroughness of field support and quality and availability of help desk support were a distant second for SSSA respondents, while quality and availability of online support and timeliness of system accreditation tied for third. PEO/PM participants believed timeliness of system accreditation was primary, with timeliness of software upgrades and cost of field support upgrades second and third, respectively.

Based on the results, the original study questions can be answered within the limits and assumptions of the research.

(1) Is the perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs and software support service providers better or worse since the 1997 ASA(RDA) decision?

(2) Is the perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs, and software support service providers better or worse since the 2004 MOA between the ASA(ALT) and CG AMC?

(3) What is the current perception of software sustainment support for Army C4ISR systems among users/units, PEOs/PMs, and software support service providers?

The perception of software sustainment support is generally the same or only slightly better among the PEO/PM and SSSA sectors of the Army C4ISR communities since the 1997 and 2004 Army policy decisions were made. While survey participants agree that improvements should be made, the distribution of suggested improvements differed substantially among the C4ISR community sectors.

Limitations

Chapter 1 explained the limited nature of the Army C4ISR community and described the inability to achieve a statistically significant sample size of this community due to the limited response to the survey. The study was also confined to perceptions of members of the Army C4ISR community. It did not address objective data regarding the quality, timeliness, cost, and thoroughness of software sustainment support. These limitations will contribute to suggestions for further and expanded research in this study area.

Implications for Further Research

This research broadly demonstrates that studies can be performed which provide information of value to DoD leaders in assessing the impacts of their acquisition policy decisions. Conducting these studies can also assist in formulating future policy changes. While this study was limited to the perception of participants, studies should also be conducted on objective data regarding software support quality, timeliness, cost, and thoroughness. When merged with data on participant perceptions, a more complete picture of software sustainment support can be provided to leaders. This type of research can be expanded beyond the field of software support within the Army C4ISR community to many different acquisition areas within DoD. Research limitations point to the need for better mechanisms to distribute surveys and other research vehicles in order to improve the statistical significance, application, and scope of research. Rather than rely on key participants to further distribute research vehicles, studies should directly contact the entire community. While not all members will respond, contacting all members will increase the likelihood and number of responses, thus increasing the sample size and improving the statistical significance of study results.

SUMMARY AND CONCLUSIONS

This study was limited to the sustainment support of software within Army C4ISR systems. A survey of a small sample of the Army C4ISR community provided information on the perception of software sustainment support before and after two significant acquisition policy decisions. One decision in 1997 by the ASA(RDA) made PMs responsible for the entire life-cycle management of a program. In 2004, the ASA(ALT) and CG AMC signed an MOA creating LCMCs and more closely associating these organizations with PEOs.

Results indicate the perception of software sustainment support for Army C4ISR systems has, in general, remained the same or only slightly improved during each of the three periods in question, supporting the first two study hypotheses. However, the varied scoring among different sectors of the Army C4ISR population sample indicate the sustainment support community may have perceptions that are more widely distributed, even if the central tendency is similar to other sectors. Results did not support the hypothesis that different subgroups of the Army C4ISR community have the same perceptions about software sustainment support. Instead, results indicate sectors of the Army C4ISR community differ regarding what areas of software sustainment support need further improvement. While most PEO/PM personnel appear to be concerned about system accreditation, most SSSA personnel indicate concern with the cost of field software support.

The study indicates there is value to conducting similar and expanded research on various acquisition processes, the perception of those processes, and the impact of policy decisions on those processes. If these additional and expanded studies overcome study limitations, analysis resulting from data collected will be more useful and valid across broader aspects of the acquisition enterprise. For example, there are at least two interpretations of these study results. A positive perspective would be that the perception of software support following the two acquisition decisions remained the same, or improved slightly. A less positive perspective could be that even after expending significant resources and effort to implement the two acquisition decisions, the perception of software support for Army C4ISR systems did not significantly improve. Is one perspective correct? Are both perspectives correct? This study cannot answer these questions.

The study does point to the possibility that significant acquisition policy changes, and the investment required to implement those changes, may not result in equivalent benefits. This suggests that a more robust system able to measure the cost savings and effectiveness of major acquisition policy changes may be needed to inform decisions made by our senior leaders.

The business of military system acquisition doesn't begin with a contract request for proposal and end with the fielding of a product. System acquisition begins with a statement of need. That need will not be met with the delivery of a system. The need is met with an operational system, ready to perform when the mission demands. Throughout its life, the system requires support both to maintain existing functionality, and to enhance functionality to meet changing environments and threats. As business and geopolitical conditions change, DoD acquisition leaders develop, review, and modify acquisition policies, programs, and processes to provide warfighters the systems they need to win. In the current return to fiscal austerity, DoD leaders require robust information to inform decisions and ensure that the most cost-efficient and mission-effective acquisition policies are implemented. Studies such as this one can contribute information that helps leaders develop and execute acquisition policies to meet warfighter needs.

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GLOSSARY OF ACRONYMS AND TERMS

AKO	Army Knowledge Online
AMC	Army Materiel Command
AMCOM	Aviation and Missile Command
AR	Army Regulation
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASA(RDA)	Assistant Secretary of the Army for Research, Development, and Acquisition
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CECOM	Communications-Electronics Command
CG	Commanding General
DoD	Department of Defense
LCMC	Life Cycle Management Command
MOA	Memorandum of Agreement
MSC	Major Subordinate Command
PEO	Program Executive Office
PEO C3T	PEO Command, Control, Communications, and Technology
PEO EIS	PEO Enterprise Information Systems
PEO IEW&S	PEO Intelligence, Electronic Warfare and Surveillance
PM	Program Manager
PMO	Program Management Office
STRICOM	Simulation and Training Technology Command
TACOM	Tank and Automotive Command
URL	Uniform Resource Locator
USD(AT&L)	Under Secretary of Defense for Acquisition Technology and Logistics

APPENDIX A

SURVEY INSTRUMENT

HELLO,

I am conducting research on the perception of software sustainment support for Army C4ISR systems. Survey results will be published in a research paper for the Defense Acquisition University (DAU) with the potential for wide distribution within the Army acquisition workforce. Copies of this research paper will be available upon request pending publication and approval by DAU.

Names of survey participants will not be revealed in the research paper. During a pilot survey, participants took less than 10 minutes to complete the questionnaire. Please select the best response to each question. If you know of other Army C4ISR system PEO/PM, software support, or user/operator personnel who should complete this survey, request you provide them this Wwebsite.

I greatly appreciate your participation in the survey.

Steven C. Cooper
Fellow
Defense Acquisition University
Aberdeen Proving Ground, MD

1. I am currently an Army C4ISR, or am affiliated with an Army C4ISR (Please check only one item that best applies):

[ ] System User/Operator

[ ] System PEO/PM

[ ] System Software Support Activity

[ ] System Development/Support/User Contractor

[ ] Other

2. I have been affiliated with the operation, development, and/or support of Army C4ISR systems (Please check only one item that best applies):

[ ] Since Before 1998

[ ] Since Before 2004 But After 1998

[ ] Since 2004

3. Prior to 1998 software support for Army C4ISR systems after fielding by the PM was (Please check only one):

If you checked “Since Before 2004 But After 1998” in question 2, please skip this question and go to questio 4. If you checked “Since 2004” in question 2, please skip this question and go to question 5.

[ ] Excellent

[ ] Good

[ ] Adequate

[ ] Poor

[ ] Very Poor

4. Between 1998 and 2004 software support to C4ISR systems after fielding by the PM was (Please check only one):

If you checked “Since 2004” in item 2, please skip this question and go to question 5.

[ ] Excellent

[ ] Good

[ ] Adequate

[ ] Poor

[ ] Very Poor

5. Overall, current software support to C4ISR systems after delivery by the PM has been (Please check only one):

[ ] Excellent

[ ] Good

[ ] Adequate

[ ] Poor

[ ] Very Poor

6. Please select the areas you believe require improvement in providing software support (Please check all that apply):

[ ] Quality of Software Upgrades

[ ] Cost of Software Upgrades

[ ] Timeliness of Software Upgrades

[ ] Quality/Thoroughness of Field Support

[ ] Cost of Field Support

[ ] Timeliness of Field Support

[ ] Quality/Availability of On-line Support

[ ] Cost of Online Support

[ ] Quality/Availability of Help Desk

[ ] Cost of Help Desk

[ ] Quality of Information Assurance

[ ] Cost of Information Assurance

[ ] Implementation of Information Assurance

[ ] Quality of System Accreditation

[ ] Cost of System Accreditation

[ ] Timeliness of System Accreditation

[ ] Other

7. Please provide any comments you may have regarding software sustainment support for Army C4ISR systems:

APPENDIX B

SURVEY RESPONSES

RECORD	AFFILIATION	TIME	BEFORE 1998					BETWEEN 1998 AND 2004					AFTER 2004				
			E	G	A	P	VP	E	G	A	P	VP	E	G	A	P	VP
J0001	SSSA	S2004												1			
J0002	SSSA	B1998		1									1				
J0003	SSSA	B1998		1					1					1			
J0004	SSSA	B1998		1						1					1		
J0005	PEO/PM	B1998			1											1	
J0006	SSSA	B1998			1				1					1			
J0007	SSSA	B1998		1					1					1			
F0001	SSSA	B1998		1				1							1		
F0002	SSSA	B1998	1						1					1			
F0003	PEO/PM	B1998			1				1					1			
F0004	SSSA	B1998	1						1					1			
F0005	SSSA	B1998				1				1					1		
F0006	PEO/PM	B1998		1					1					1			
F0007	CON	B1998			1					1				1			
F0008	OTHER	S2004													1		
F0009	SSSA	B1998			1					1					1		
F0010	OTHER	B1998			1					1				1			
F0011	SSSA	S2004												1			
F0012	OTHER	B1998			1				1					1			
F0013	SSSA	S2004												1			
F0014	SSSA	B1998					1				1				1		
F0015	SSSA	B1998		1					1					1			
F0016	SSSA	B1998	1					1					1				
F0017	SSSA	S2004												1			
F0018	SSSA	A1998							1				1				
F0019	PEO/PM	S2004													1		

RECORD	AFFILIATION	TIME	BEFORE 1998					BETWEEN 1998 AND 2004					AFTER 2004				
			E	G	A	P	VP	E	G	A	P	VP	E	G	A	P	VP
F0020	PEO/PM	B1998		1					1					1			
F0021	PEO/PM	A1998							1					1			
F0022	PEO/PM	B1998		1					1					1			
F0023	PEO/PM	A1998							1					1			
F0024	PEO/PM	A1998							1					1			
F0025	SSSA	B1998			1				1					1			
F0026	SSSA	B1998			1				1				1				
F0027	SSSA	B1998		1					1					1			
F0028	OTHER	B1998		1						1				1			
F0029	USER	B1998			1				1				1				
F0030	PEO/PM	B1998			1				1					1			
F0031	SSSA	S2004											1				
F0032	OTHER	A1998								1				1			
M0001	CON	S2004												1			
M0002	SSSA	B1998				1				1					1		
M0003	OTHER	S2004												1			
GRAND TOTALS	42	42	3	11	11	2	1	2	20	8	1	0	6	27	8	1	0

RECORD	AFFILIATION	TIME	AREAS OF IMPRVOVEMENT															
			SWQ	SWC	SWT	FSQ	FSC	FST	OLQ	OLC	HDQ	HDC	IAQ	IAC	IAI	SAQ	SAC	SAT	OTH
J0001	SSSA	S2004					1			1								1	1
J0002	SSSA	B1998					1							1			1	1	
J0003	SSSA	B1998			1	1	1		1		1								
J0004	SSSA	B1998			1		1				1							1	
J0005	PEO/PM	B1998	1	1	1		1			1		1		1			1	1	
J0006	SSSA	B1998					1		1		1								
J0007	SSSA	B1998			1		1		1										
F0001	SSSA	B1998	1			1	1	1					1	1	1		1	1	
F0002	SSSA	B1998		1															
F0003	PEO/PM	B1998	1		1	1	1				1					1	1	1	
F0004	SSSA	B1998																	
F0005	SSSA	B1998			1	1		1											
F0006	PEO/PM	B1998	1	1	1														
F0007	CON	B1998	1	1	1	1	1	1											
F0008	OTHER	S2004																	
F0009	SSSA	B1998							1		1					1			
F0010	OTHER	B1998			1											1			
F0011	SSSA	S2004		1	1		1			1		1					1		1
F0012	OTHER	B1998	1	1	1	1			1		1				1			1	
F0013	SSSA	S2004			1		1				1	1	1	1					
F0014	SSSA	B1998				1	1	1	1	1	1	1							
F0015	SSSA	B1998					1												
F0016	SSSA	B1998					1												
F0017	SSSA	S2004																	
F0018	SSSA	A1998					1				1	1							
F0019	PEO/PM	S2004																1	

RECORD	AFFILIATION	TIME	AREAS OF IMPRVOVEMENT															
			SWQ	SWC	SWT	FSQ	FSC	FST	OLQ	OLC	HDQ	HDC	IAQ	IAC	IAI	SAQ	SAC	SAT	OTH
F0020	PEO/PM	B1998			1		1	1	1	1		1					1	1	
F0021	PEO/PM	A1998	1		1				1		1							1	1
F0022	PEO/PM	B1998	1		1		1					1		1				1	
F0023	PEO/PM	A1998			1	1	1	1	1		1							1	
F0024	PEO/PM	A1998				1	1		1						1		1	1	
F0025	SSSA	B1998	1			1			1				1					1	
F0026	SSSA	B1998	1			1		1	1		1		1						
F0027	SSSA	B1998				1	1									1	1	1	
F0028	OTHER	B1998	1			1		1								1	1	1	
F0029	USER	B1998	1			1		1	1		1		1						
F0030	PEO/PM	B1998		1	1		1								1		1	1	
F0031	SSSA	S2004	1				1							1				1	
F0032	OTHER	A1998	1		1		1											1	
M0001	CON	S2004	1		1													1	
M0002	SSSA	B1998				1	1								1				
M0003	OTHER	S2004																	
GRAND TOTALS	42	42	15	7	19	15	25	9	13	5	13	7	5	6	5	5	10	20	3

APPENDIX C

SURVEY COMMENTS

RECORD NUMBER	COMMENTS
J0002	Many times software sustainment by organic capability is not consider by ASAA-LT community, nor previously stressed by DA in general. . . . Pushing QRCs out by PM offices is one thing, but not doing due diligence in terms of procuring data rights and planning for transition from ORM has been a large problem putting the Army at risk and cost.
J0003	Over the period collected by the survey field support of software for C4ISR systems has grown tremendously in response to multiple factors including system complexity, requirements for readiness, contingency operation requirements, etc. The growth of field support personnel was required to meet this requirement. Initial field support to C4ISR systems had top engineers that were experienced with the systems during their initial development, this is no longer the case so the experience level of the FSE has degraded over the entire period.
J0006	Software Sustainment should a key parameter in the design and development of the system. The U.S. Army should have a software sustainment plan and process for each system.
J0007	I believe the majority of staffers don't have a clue as to what's involved/required to sustain software. There appears to be a belief that sustainment is simply keeping the software running as long as possible. However, software sustainment today really incorporates software changes as the business changes, incorporating new technologies to replace those that are no longer supported. It's adapting that software to new environments - either new hardware, operating systems or network connections. It's keeping the entire "system" current and useful and extending its life cycle utilization.
F0002	Software Sustainment needs to address remediation in systems in sustainment of critical software assurance deficiencies that are defined as critical in accordance with the Application Security Technical Implementation Guide of the Defense Information Systems Agency as noted in Section 932 related to Information Assurance policy as part of the DoD Authorization Bill FY2011. These deficiencies will not only incur security risk but will increase costs and chance of system failure as the system is maintained in the out years.
F0003	Many PMs do not transition their programs to PDSS/PPSS in an expected timeframe. Transitioning your system as early as practical will free up resources at the PM level and also enable sustainment funding.
F0004	Generals and high officials get involved in problems that can be easily resolved by developers. Lots of government expertise has driven up contractor cost. Academia and PHD type folks have driven away common sense and stick-to-it mentality. We make fewer mistakes, but learn nothing. The process works, but who can afford it? I think that the acquisition strategy is designed to deliver the best product, but at a cost the government cannot afford to pay.
F0005	Coordination between dependent system and meeting schedules.
F0008	I do not have any knowledge of software sustainment support.

F0012	Timeliness is a big thing for supporting the systems. One of the items that contributes to long delays is the configuration management process. Configuration management is extremely necessary, but some way needs to be found to streamline the process and make software updates, upgrades and over-all support more timely.
F0014	Need FSRs who are capable of maintaining multiple systems instead of FSRs who are specialized in only one system.
F0019	Funding process and commitment of same by SEC leaves much to be desired. System is very broken and PM is left to fight for every penny. Special problem areas are sustainment funding after transition and license maintenance. Typical SEC scenario is to "lowball" everything and create much extra work for the PM staff to justify and rejustify to the extreme. I have not seen the "learn" effort that should be present in this process. It's "US" vs "THEM" and that is definitely NOT the way the Army intended. Other areas of support (especially FSE and Information Assurance have been EXCELLENT.
F0020	COCOMs have sufficient funding to build their own stovepiped systems. These efforts have a direct adverse effect on the use, maintenance, and effectiveness of system of record C4ISR systems.
F0022	Too disjointed. We fail to recognize the difference between contract management and operational support. Current system geared more to the management piece vice problem identification, management, tracking and resolution.
F0023	System support needs to be adopted in a manner that recognizes that Depot and Field Support cannot work together if leadership of same is separate. Having been associated with software programs for more than 10 years now, I have witnessed a fairly abrupt change to how Field Support responds to customer requirements and in some cases a perceived indifference to Depot level support. It makes it very complex for an end user to understand who is providing what level of support to their problem. I don't quite understand how this then translates to Single Face to the Field.
F0024	Make IA and SW patch updates easier for units to handle on their own instead of relying on contractor support. This becomes an issue when the lower-density systems are due to receive a patch yet the FSRs are not readily available to assist due to their low numbers and prior commitments.
F0025	As software becomes more complex, we are more reliant on contractor support vice "soldier" support. In the late eighties through late nineties, most trouble-shooting and basic fixes were done by the soldier/operator (how I became involved and interested in support.) Even more complex fixes were done by the soldier/operator with telephonic/mail assistance. Now, even basic trouble shooting cannot be conducted by the soldier/operator; it requires a Field Support contractor (or System Administrator) to evaluate problems beyond "it's not working right" putting an enormous strain on the limited workforce.

F0026	The Unit Set Fielding process by which the units are given the training and then fielded the systems in a coordinated and synchronized manner has helped the units better understand the network they are operating, rather than just a few of the individual systems. The RESET process does the same for redeploying units. The digital system engineer program has helped sync the field support to the C4ISR systems by the FSRs, especially in the units with many digital systems. The training and experience within the field workforce has increased which has enabled the units to better utilize the systems.
F0027	I believe we have come a long ways in providing sustainment support over the years, but we have become prisoners to the costs of contractors. We need to go back to the soldiers being skilled on their own C4ISR systems to minimize the need for over charging contractors.
F0028	The lack of qualified FSEs that have the capability to support any of the PM platforms that falls under the contract. Having system specific FSEs hampers the ability to deploy in support of multi-mission requirements. That makes for higher unit costs because they have to take more contractors.
F0029	Availability of FSE personnel is limited due to budgetary constraints and lack of trained personnel. Although previously deleted, the assignment of FSE directly to units is a must for successful operations. Solid FSE and management are overcoming this constraint, but the support force is stretched thin.
M0002	SW is viewed as an anomaly vs HW. Leadership doesn't understand SW sustainment maximizes a system investment ROI (being too quick to suggest letting fielded systems obsolesce, then need risky expensive replacements.) These same people wouldn't suggest buying a fleet of tanks/trucks and not providing for their maintenance, yet do just that for their SW. Uneven approach to SW sustainment leaves to each PM to decide, but should be done in institutionalized governance process that considers the entire portfolio and lifecycle. Uneven field support should be institutionalized via AMC in support of PM.